What is Gravity?

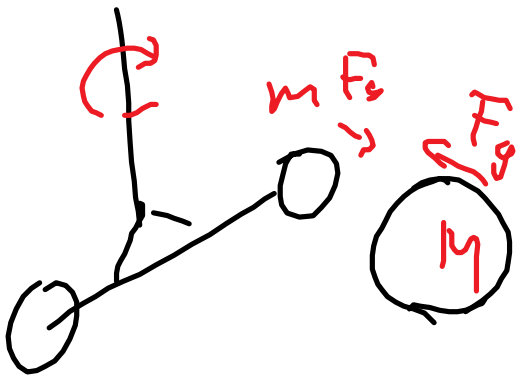
Aristotle - force that pulls things down. More mass, things fall faster.

Galileo - things fall independent of mass if air resistance is negligible.

Newton - All objects attract each other, proportionally to their mass and inversely with the distance between their centres, r, squared.

$F_g \propto Mm/r^2$
proportional
F_g is the force between the two masses , in N.
M and m are any two masses, in kg.
r is the distance between the centre of the two masses (assuming perfect spheres of uniform density) in metres.
What is the constant of proportionality?

Cavendish - built a torsion pendulum
Two lead spheres on a balanced beam, suspended by a cable. One of the spheres is brought near a third sphere and the force of attraction is measured.



$F_g = GMm/r^2$
where G is the universal gravitational constant
$= 6.67 \times 10^{-11}\ Nm^2/kg^2$

Einstein - gravity is curvature in space-time - time flows differently near massive objects.

Dark Matter - astronomical objects orbit at periods determined by the mass their orbit around. The observations indicate that there is matter we can't see causing gravity but not interacting with electromagnetism (like neutrinos)

Dark Energy - universe is speeding up, dark energy is the hypothesized source of this kinetic energy.

Back to Newton:

1. What is the gravitational attraction between a 60.0kg student and a 50.0 kg student 1.5 m

apart? Why don't they slide together.

2. g on Earth is 9.81 N/kg, if the radius of Earth is 6.38×10^6 m, what is it's mass?

Hecht p171-
problems 27-37 odds, 47